

CLAIMS

1. A method for programming an industrial robot having a tool, to perform a process on an object while following a robot path defined by a number of waypoints, the method comprising:
 - obtaining configuration data including configuration data for the tool, configuration data for the robot path and information about the position and orientation of the object in relation to the robot,
 - obtaining a sequence of waypoints, which defines the process in relation to the object, the waypoints comprises information about desired positions of the tool in relation to the object and desired positions of process events in relation to the object,
 - obtaining at least one distance for adjusting the position of a waypoint,
 - deciding whether an obtained waypoint should be modified or not, based on the obtained information about the waypoints,
 - generating a modified sequence of waypoints by modifying the waypoints in the obtained sequence of waypoints, based on said decision, the obtained distance and the obtained information about the waypoints, and
 - generating the actual robot path based on the modified sequence of waypoints and the obtained configuration data.
2. A method according to claim 1, wherein obtaining a sequence of waypoints, comprises:
 - obtaining information about the position of a pointing member pointing at points on or in the vicinity of the object,
 - storing the point being presently pointed out by the pointing member as a waypoint upon receiving a recording signal,
 - obtaining information about a process event,
 - storing the information about the process event together with the position of the waypoint, and
 - determining the position of the points in relation to the object based upon said obtained information.

3. A method according to claim 1 or 2, wherein said modifying of a waypoint is made based on a set of predefined rules.
4. A method according to any of the previous claims, wherein
5 said decision comprises
 - determining whether a waypoint comprises a specific process event,
 - deciding that the waypoint should be modified if the waypoint comprises the specific process event.
- 10 5. A method according to claim 4, wherein it is decided to modify a waypoint if the waypoint comprises any of the process events: turn on the process and turn off the process.
- 15 6. A method according to any of the previous claims, wherein modifying a waypoint comprises: adding a new waypoint to said sequence of waypoints and determining a position for the new waypoint based on said distance and the obtained waypoints.
- 20 7. A method according to claim 6, wherein said obtained distance is a point extension distance which depends on a desired tool speed in the waypoint, and the position for the new waypoint is determined based on said point extension distance.
- 25 8. A method according to claim 6 or 7, wherein the position for the waypoint is determining based on the position of the current waypoint and the position of the previous waypoint or the next waypoint.
- 30 9. A method according to claim 4 and 8, wherein determining the new position for the waypoint comprises:
 - determining a direction based on the position of the current waypoint and the position of the previous waypoint or the position of the current waypoint and the next waypoint, depending
- 35 on the process event, and

- obtaining the new position by adding the point extension distance to the position of the obtained waypoint in the determined direction.
- 5 10. A method according to claim 4 and any of the claims 2, 3, or 5-9, wherein modifying a waypoint comprises: determining a new position for the process event based on said obtained distance and the obtained waypoints, and moving the process event to the new position.
- 10 11. A method according to claim 10, wherein said distance for adjusting the position of a waypoint is an event extension distance which depends on a tool speed and a delay time in connection with the process event and the new position for the process event is determined based on said event extension distance.
- 15 12. A method according to claim 11, wherein determining the new position for the process event comprises:
- 20 - determining a direction based on the position of the current waypoint and the position of the previous waypoint or the position of the current waypoint and the next waypoint, depending on the process event, and
- 25 - obtaining the new position by adding the event extension distance to the position of the current waypoint in the determined direction.
- 30 13. A method according to any of the previous claims, wherein said configuration data for the robot path includes the size of an arch between two line segments on the robot path and the configuration data for the tool comprises definition of a tool center point.
- 35 14. A method according to any of the previous claims, wherein it generating the robot path comprises generating robot program code based on the waypoints and the configuration data.

15. A method according to any of the previous claims, wherein
the waypoints comprises information about the orientation of the
tool and the method comprises copying the orientation of the
5 last waypoint to the obtained waypoint upon request.
16. A method according to any of the previous claims, comprising
storing the obtained waypoints in a first waypoint list and
storing the modified sequence of waypoints in a second way-
10 point list.
17. A computer program product directly loadable into the inter-
nal memory of a computer, comprising software code portions
for performing the steps of any of the claims 1–16, when said
15 product is run on a computer.
18. A computer readable medium having a program recorded
thereon, where the program is to make a computer perform the
steps of any of the claims 1–16, when said program is run on
20 the computer.
19. A system for programming an industrial robot having a tool,
to perform a process on an object while following a robot path
defined by a number of waypoints, the system comprises:
25 - information obtaining means, obtaining information about
configuration data, tool speeds and a sequence of waypoints,
which defines the process in relation to the object, the way-
points comprises information about desired positions of the tool
in relation to the object and desired positions of process events
30 in relation to the object,
- a storage unit, for storing the obtained information, charac-
terized in that the system further comprises:
- means for deciding whether an obtained waypoint should be
modified or not, based on the obtained information about the
35 waypoints,

- means for generating a modified sequence of waypoints by modifying the waypoints in the obtained sequence of waypoints, based on said decision, a distance for adjusting the position of a waypoint and the obtained information about the waypoints, and
- 5 - a robot path generator, generating the actual robot path based on the modified sequence of waypoints, the tool speed and the obtained configuration data.
20. A system according to claim 19, characterized in that the
- 10 system further comprises: a pointing member adapted for pointing out points on or in the vicinity of the object, a position determining means, determining the position of said points in relation to the object, and an activating member, storing a point as a waypoint upon activation.
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21. A system according to claim 20 or 21, characterized in that it comprises a robot programming-code generator, generating robot-programming code based upon the generated robot path.
- 20 22. A system according to any of the claim 20-22, characterized in that said information obtaining means is adapted for receiving information about tool orientations in the waypoints and the system comprises means for copying information about the orientation from a waypoint to another waypoint.
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23. Use of the method according to any of the claims 1–16 for a paint application.